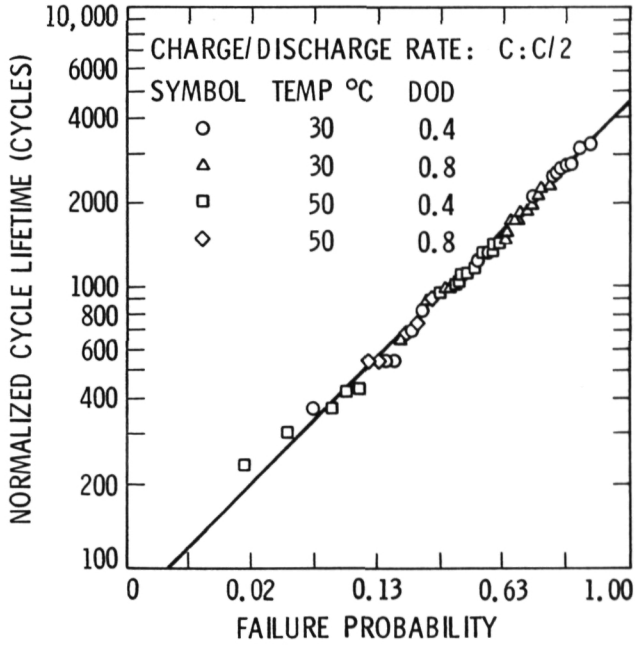
NICKEL-CADMIUM BATTERY RESEARCH

Spacecraft designers have the problem of trying to predict the reliability of nickel-cadmium batteries used in many power systems. Researchers at JPL developed a failure-predictability model that correlates variables such as battery temperature, size, and discharge depth for the first time.

The successful testing of the model is regarded as a major step toward realistic life prediction and performance evaluation of nickel-cadmium batteries. The theory evolved hypothesizes that flaw growth in a battery is due to the interaction between electrons and flaws, and a cell failure will occur when a flaw reaches a critical size.

The figure below shows how the model can be used to estimate battery lifetime and reliability.

- FLAW THEORY
  - FAILURE DUE TO GROWTH OF FLAWS ABOVE CRITICAL SIZE
  - GROWTH RELATED TO ELECTRON MOVEMENT
- FOR THE FIRST TIME A THEORY SUCCESSFULLY CORRELATES CRANE TEST DATA TO YIELD LIFE PREDICTION
- MAJOR STEP TOWARD
  - LIFE PREDICTION AND PERFORMANCE EVALUATION
  - INDICATOR OF FAILURE MECHANISM
  - GUIDE FOR RESEARCH AND TEST PLANNING



Nickel-cadmium cell failure model.